Peers and Fertility Preferences: An Empirical Investigation of the Role of Neighbours, Religion and Education[*]

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Abstract

Individual fertility preference is influenced by observed social norms. The present paper investigates the effect of the *observed fertility* of peers on a woman's *fertility preference.* We explore the role of two peer groups: neighbourhood peers and religious peers. Data from the National Family Health Surveys (1992-93, 1998-99 and 2005-06) in India is employed for empirical estimations using a multinomial logit model. We find that both neighbourhood and religious peers have a significant impact on individual fertility preferences, but their relative importance changes with family size. An increase in peer fertility increases the probability of preferring more children. We further examine the roles of education and wealth as transmission channels between the fertility norms of peers to the fertility preferences of the women and find that education plays an important role in moderating peer influences. These findings can serve as vital inputs in formulating family planning and gender policies.

Keywords: peer effects, multinomial logit, fertility, India, education, wealth status

JEL codes: D12, J13

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1. Introduction

In a simple economic framework, fertility is analysed as an individual or a household decision. However, it has long been recognised that individual fertility is not only influenced by individual preferences and constraints, but is also shaped by wider societal influences. In this paper, we contribute to the understanding of the influence of these societal norms on fertility preferences by exploring the impact of peer fertility. We find that the observed fertility of neighbourhood peers has a strong influence on fertility preferences. Fertility preferences are also shaped by the fertility norms prevailing in associated religious groups.

We extend the existing literature in several important directions. First, we study the peer effects on *fertility preferences*. The empirical literature on peer effects on fertility so far has studied fertility in terms of contraceptive use or children (number of children, or birth of a child in a defined time period). We model fertility in terms of the ideal number of children a woman would like to have, thus concentrating on fertility preferences. This complements existing studies by shedding more light on the mechanism of peer effects, a change in preferences versus a change in behaviour. Secondly, as McNicoll (2009) argues, fertility transitions are driven by legacy (including cultural and institutional inheritance), circumstances (the larger political and economic environment) and policy. We analyse the role of community and cultural legacy in the form of religious and geographical community. We identify two groups from whom an individual references her fertility preferences: neighbourhood peers and religious peers. By investigating the relative importance of these two peer groups, we can shed light on the role of social groups in fertility. The third contribution of this study is particularly relevant for policy. We show that education is a

particularly important channel for moderating peer effects; hence, education can be an effective policy tool, particularly for countries in a high fertility trap. Our finding of the moderating role played by education on peer effects is in line with McNichol's (2009) suggestion that the main scope for policy effects on fertility transitions is through reshaping the societal features governing fertility behaviour. While the important role of education in fertility transition is well established, we contribute to the policy discussion by empirically demonstrating one mechanism of this effect.

Literature review

The effects of social groups on individual behaviour are well recognised in the context of education (see Sacerdote, 2011, for a recent review of this literature). Studies now provide empirical evidence for such effects in other contexts as well, such as on consumption decisions (Moretti, 2011), migration (Chen et al., 2010), charitable giving (Smith et al., 2015) and criminal (Gaviria and Raphael, 2001) and risk taking behaviours (Lahno and Serra-Garcia, 2014). In a broad sense, peers' background, current behaviour and outcomes generate an externality, affecting other individuals.

Fertility decisions are social decisions. In contrast to purely economic decisions which are primarily driven by direct changes in utility due to choices, social decisions are made in the context of the social network, and the interaction with its members may be the primary determinant of these choices (Akerlof, 1997). The fertility literature recognises the role of social interactions, through social learning and social influences, on individual fertility (Kohler et al., 2001). Social influences are normative influences on behaviour, with individuals influenced by the opinions and behaviour in their social environment. In conceptualising and estimating peer effects, we employ the proposition by Akerlof (1997)

that an individual acts in a conformist manner in her fertility decisions; hence, she attempts to minimize the social distance between herself and others. Thus, in the present context, in addition to reacting to their private economic trade-offs, prospective parents respond to social norms about "appropriate" family size by minimising their fertility distance from others as best they can. Zafar (2012) suggests that individuals conform to their reference group through: (i) social learning through the experience of others; (ii) utility gain from making the same choice as the group; or (iii) sticking to the norm through image-related concerns.

Individuals form their fertility preferences by observing social norms. These norms are derived from groups that are close in terms of social distance. These social groups can be inherited (such as family and religion) as well as acquired (through workplace or neighbourhood). Axinn et al. (1994) document the important role of the immediate family in the form of a mother's preference. Cross-sibling influences (Kuziemko, 2006; Lyngstad and Prskawetz, 2010) provide further evidence of such transmission. Such social interactions are also found within a workplace (Ciliberto et al., 2013) and community (Kravdal, 2002; Kohler et al., 2001). The social peers on whom individuals rely to form their fertility preferences may extend to religious groups within the community, as documented by Munshi and Myaux (2006) in the case of Bangladesh.

These studies provide important empirical evidence for peer effects on fertility. The findings of these studies show that factors influencing individual fertility behaviour extend beyond the individual. The results from these studies are consistent in finding that social groups do have an effect on individual fertility. However, the existing literature concentrates on one particular group for analysis. We contribute to this literature by assessing the relative importance of two groups. Further, studies so far model fertility in terms of contraception use

or number of children, thus concentrating on the fertility behaviour. The present paper extends this analysis by investigating the effect of peers on fertility preference. The choice between behaviour and preference in fertility analysis is further discussed below. This paper also explores the interaction between peer effects and other control variables in order to better understand the channels of effects on fertility.

Understanding the magnitude and role of these channels has obvious policy implications. Moreover, they can also have important implications for fertility theory, as illustrated by Bhattacharya and Chakraborty (2012) who show the importance of social norms in the relationship between fertility and child mortality. We further explore the role education plays in moderating social influences on fertility. Studies have consistently documented that fertility declines with an increase in education levels (e.g. Kalsen and Launov, 2006; Zanin et al., 2014). In the context of India, Drèze and Murthi (2001) provide robust evidence for the role of women's education in fertility decline, by influencing: (i) desired family size; (ii) the relationship between desired family size and planned number of births; and (iii) women's ability to achieve the planned number of births. Our results support Drèze and Murthi's (2001) hypothesis that female education can be expected to reduce desired family size through enhanced receptiveness to modern social norms by moderating the influence of the traditional channels of religion and neighbours. Cochrane et al. (1990) and Sathar et al. (2003) have documented the effect of education on desired family size in the context of Egypt and Pakistan, respectively. However, the present study is the first to document that education affects fertility preferences by moderating peer effects.

Fertility can be modelled either as fertility behaviour or as fertility preference. While fertility behaviour does not exactly and perfectly match preference, preferences and intentions for

future childbearing are found to predict fertility behaviour (Hayford and Agadjanian, 2012). Hakim (2003) points out the importance of female preferences and values, particularly given the advances in fertility control. The predictive ability of preferences has been extensively documented in a wide variety of contexts, in developed and developing countries across a cross-section of geographical locations and fertility levels. Recent examples include evidence from the United States (Quensnel-Vallée and Morgan, 2003), Malaysia (Da Vanzo et al., 2003) as well as from low income, high fertility countries in Africa (such as Hayford and Agadjanian, 2012 for Mozambique and Kodzi et al., 2010 for Ghana). In the context of India, Roy et al. (2008) find that the preference for ideal family size has a consistent and predictive link to subsequent fertility. The present analysis exploits this link by employing fertility preferences to study peer effects on fertility. Using preference rather than behaviour enables us to focus on changes in preference through social interactions. Employing preference as a dependant variable also enables us to avoid analytical issues in capturing imitation effects, while maintaining the implications of the analysis for fertility behaviour.

2. Empirical Strategy

Data

We employ data from the National Family Health Survey (NFHS) conducted by the International Institute for Population Sciences (IIPS) under The Ministry of Health and Family Welfare (MOHFW), Government of India. It is a large-scale, multi-round survey conducted in a representative sample of households throughout India. We employ all three rounds of the survey conducted in 1992-93 (NFHS 1), 1998-99 (NFHS 2), and 2005-06 (NFHS 3), covering 25, 26 and 29 states in India respectively. The analysis here is performed

using the 17 major states.[1] The survey provides detailed information on fertility for women aged 15-49.[2] Importantly for the present analysis, in addition to the usual fertility indicators such as number of children, the survey includes questions pertaining to preferences regarding the number of children a woman would like to have. We use this information to define the dependent variable in the analysis.

The survey adopts a two-stage sample design in rural areas and a three-stage sample design in urban areas. Primary sampling units (PSUs) were selected followed by selection of households within the PSUs.[3] The PSUs normally comprise single villages. In the case of very small villages, neighbouring villages are joined together and, in the case of urban areas, the PSUs are formed on the basis of census enumeration blocks. This sampling design enables us to identify the peer groups.

Identifying peers

Our aim is to identify peers who facilitate the formation of fertility preference. As discussed earlier, individuals consider their personal trade-offs in making fertility choices, but they also conform to social norms. Thus, they reference their fertility preferences from the fertility choices of their peers. Our first definition of peers is based on the immediate social environment of an individual: that is, their neighbourhood. As pointed out by Gaudin (2011), and Kravdal (2002), PSUs provide a good measure of *neighbours* at the community level.

[1] The 17 major states included in our analysis account for roughly 90% of India's population and make up around 87% of India's GDP. The remaining 11 states, not included in the analysis, were either created very late in the period of analysis and data for which is available only for NFHS3 (such as Chhattisgarh, Jharkhand and Uttrakhand), were too small with lots of missing data points (Goa, Mizoram, Sikkim, Arunanchal Pradesh and Maghalya for example), or had unreliable data points (Jammu, Kashmir and Nagaland, for example).

[2] While it would be interesting to analyse men's preferences as well, the data provides detailed information related to women only. Hence, we restrict the analysis to women.

[3] Details of the sampling strategy is available at http://dhsprogram.com/Publications/Publication-Search.cfm?ctry_id=57&c=India&Country=India&cn=India .

The mean number of households in a PSU is between 17 and 19, and the majority of PSUs consist of up to 30 households (Table 1). Further, the sample of each PSU is statistically representative of the area. Thus, PSUs are a good approximation for the neighbourhood or the immediate community within which daily interactions take place. Hence, we define neighbourhood peers as the group of women residing in the same PSU as the individual.

INSERT TABLE 1 HERE

Apart from proximity and contact within a geographical area, religious grouping is another potential transmission channel for fertility norms. Munshi and Myaux (2006) provide robust evidence on the role of religion in fertility transition in the context of Bangladesh. Traditionally, fertility norms were sustained through adherence to practices prescribed by religious authority. While social and economic changes might have weakened the sole authority of religion, it still plays a central role in many women's fertility preferences and practices. In the context of a country such as India, traditions and culture play a central role in the transmission of cultural preferences or traits. Individuals identify with their peers along family lines and on the basis of shared cultural traits, which map back to religious groups (Krishnan, 2002). We define religious peers to trace this importance of religious groups. Religious peers refers to a group of women of same religious affiliation (Hindu, Muslim, Christian, Sikh or Others), living in the same region (capital (or large) city, small city, town or countryside) of a particular state. We take the fertility rate (number of living children/total number of women) of this group as the religious peers' fertility rate. For example, for a Hindu woman living in Mumbai, Maharashtra, her religious peers would be all the Hindu women living in Mumbai. Table A1 in the appendix (Appendix A1) reports the number of women in each religious group and the average fertility rate prevailing in each religious group for the three NFHS rounds. By allowing for the influence of observed average fertility

of their own religious group, we can explore the extent to which religion's role in the transmission of fertility norms has been substituted or complemented by other influences.

Defining fertility

The analysis is based on fertility preferences expressed by women. The survey reports the ideal number of children that the respondent would like to have in her whole life, irrespective of the number she already has. To be more precise, women with no children were asked: 'If you could choose exactly the number of children to have in your whole life, how many would that be?' Women who already had children were asked: 'If you could go back to the time you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?' We employ this variable as a dependent variable to represent fertility preference.

The employed measure of fertility preference is based on "expressed preferences". This approach provides an alternative to the commonly employed "revealed preferences" (observed number of children or use of contraception). The effect on fertility outcomes (number of children, probability of having a child, probability of having another child) analysed in the literature is hypothesised to be the result of a change in fertility preferences due to peer effects. Even though peer effects affect preferences, fertility preferences do not have a one-to-one correspondence to the actual number of children due to the physical and environmental conditions which govern fertility. Manski (2000) provides a conceptual framework for modelling social interactions. Agents make decisions consistent with their preferences, formed expectations and constraints. The group (to which the agent belongs) can affect the agent's decision through these three possible channels: constraints, expectations and preferences. In the present paper, we explore the preference interactions whereby the

actions chosen by the group affect an agent's preference orderings over the alternatives in her choice set.

The empirical strategy is based on the proposition that women aim to conform to the observed social norm. Hence, we use the average number of children for the peer group as a measure of peer fertility, which is the main independent variable in the following estimations. We use the *actual* number of children instead of the *preferred* number of children, as women can only observe the former and use it to make inferences about the fertility preference of their reference group. Women cannot observe the preferred fertility of their peers. Using the *individual fertility preference* as the left hand side variable and the *observed average fertility for peers* as the right hand side variable further enables us to address the well-documented conceptual and empirical problems in estimating "imitation effects". For example, Kravdal (2003) shows that estimations using the average of the dependent variable as a regressor can be severely biased. Using two different measures of fertility as dependent and independent variables in estimations enables us to address these issues.

INSERT TABLE 2 HERE

Descriptive statistics reported in Table 2 provide background information for our sample. The descriptive statistics are reported for the pooled data from the three NFHS rounds (in keeping with our estimation sample). The average fertility rate is 3.6 for neighbourhood peers and 2.9 for religious peers. The standard deviation for neighbourhood peers indicates a wide variation in fertility that a woman observes in her neighbourhood. In our sample, education levels are very low, most women and men do not complete high school, and men are better educated compared to women. Almost all of the women report that husbands work (97.7 percent) while only 35.2 percent of women work, and 36.2 percent of the women belong to poor households in terms of household wealth. In keeping with India's broader social and demographic

distribution, the vast majority of the women reside in villages (67.3 percent) and Hinduism is the dominant religion (81.6 percent).

INSERT TABLE 3 HERE

Table 3 documents the mean values of number of children for neighbourhood peers and religious peers by state and survey round. Consistent with the mean values reported in Table 2, the fertility rate for neighbourhood peers is greater than the fertility rate of religious peers. Comparing across the NSHS survey rounds, fertility in India is declining, with the average number of children falling for both groups and all states over time. There is regional variation across the states, however, with the highest number of children in Bihar and Uttar Pradesh and lowest in Kerala. These descriptive statistics point to the presence of time and location (state) effects in observed fertility.

Methodology

The dependent variable of interest is the fertility preference of an individual expressed as the ideal number of children. Since this is fertility preference, there is no natural ranking or ordering in the outcome variable. While the number of children (e.g. two children or three children) is a cardinal variable, the preference for two children cannot be ranked in comparison to the preference for three children. Further, the variables are alternative-invariant: they do not vary over the alternative outcomes. Given the nature of the data and the underlying model, we employ a multinominal logit model (MNL) for our estimations.

Let $y_i \in \{1,2,..m\}$ denote the stated fertility preference outcome (y) for individual i and X denote the explanatory variables. Using MNL, the probability that alternative j is chosen is denoted as $p_j = Pr[y = j],\ j = 1,2,\dots,m$ and given as:

$$p_{ij} = \frac{e^{x'_{ij}\beta}}{\sum_{l=1}^{m} e^{x'_{il}\beta}} \quad \text{where } j = 1,2,\dots,m \tag{1}$$

Since $\sum_{j=1}^{m} p_j = 1$, model identification requires that the parameter β corresponding to the base category is set to 0. We use $y = 2$ as the base category. In addition to the observed average fertility of neighbourhood peers and religious peers, we include controls for age and education for the woman and her partner and relevant household head characteristics. We also control for state, time and religion fixed effects in order to isolate the peer effects from broader trends. For an unordered multinomial model, there is no single conditional mean of the dependent variable y; rather, there are m alternatives. Therefore, it is more useful to compute marginal effects (MEs) for these models, which measure the change in probabilities of m alternatives as regressors change. For multinomial logit models, MEs are computed as:

$$\frac{\partial p_{ij}}{\partial x_i} = p_{ij}(\beta_j - \overline{\beta}_i) \tag{2}$$

where $\overline{\beta_i} = \sum_l p_{il}\beta_l$.

The multinomial logit model specified in equation (1) is estimated using maximum likelihood. While the estimations yield coefficients $\hat{\beta}$, the signs of regression coefficients do not give the signs of the MEs. For a variable x, the ME is positive if $\beta_j > \overline{\beta}_\iota$. The MEs vary with the point of evaluation, x_i. The MEs reported in tables 4 and 6 are 'marginal effects at the mean' where we obtain the ME on $\Pr(y = j)$ of a change in an associated regressor when all the other regressors are kept at their sample mean, while MEs reported in tables 6 and 7 are 'marginal effects at representative values'. It has to be noted that MEs are computed differently for continuous and discrete variables. For discrete variables, 'marginal effects at

the mean' measures how $\Pr(y = j)$ changes when the discrete variable changes from 0 to 1, keeping all other variables at their sample mean. For continuous variables, 'marginal effects at the mean' measures how $\Pr(y = j)$ changes when the continuous variable increases by 1 unit, keeping all other variables at their sample mean. We calculate and report the average marginal effects that are obtained by calculating a marginal effect for each case and averaging all the computed effects. In addition to this, we also estimate the models using multi-level analysis and standard regression methods (logit model with binary dependent variable and OLS with linear dependent variable) as a robustness check. These methods and the results are reported in appendix A2.

3. Results

Peer effects

We report the calculated marginal effects (equation 2) in Table 4.

INSERT TABLE 4 HERE

The estimates for both the peer groups point to a consistent and robust peer effect. An increase in the observed fertility of the peer group reduces the preference for one or two children and increases the preference for three or more children. A unit increase in the fertility of peers reduces the probability of wanting one child by 1 percent for neighbourhood peers and 1.7 percent for religious peers. The probability of wanting two children displays the biggest impact in terms of magnitude: it falls by 6.6 percent for neighbourhood peers and 7 percent for religious peers. In the case of both peer groups, an increase in peer fertility increases the probability of preferring three or more children. The shift from a preference for two children to a preference for three children is noticeable for religious peers. Preferences for more than three children increase with an increase in the observed peer fertility; however, these increases are small and decrease with the number of children. Note that neighbourhood

peers represents women in the immediate neighbourhood and religious peers represents women belonging to the same religion in similar regions. Thus, religious groups have a larger impact on fertility choices of one, two and three children (for a smaller family size), while neighbours have a greater impact on fertility choices for bigger families (with four or more children).

Effects of other variables

INSERT TABLE 5 HERE

The average marginal effects for the full model of neighbourhood peers are presented in Table 5.[4] Significant average marginal effects for education underscore its important role. Education increases the preference for one or two children and decreases the probability of wanting any more than two children. This relationship holds for a woman's own education as well as the education level of her husband and of the household head. The effect of a woman's own education is particularly strong: each year of education increases the preference for two children by 1.64 percent. We explore the role of education and its interaction with peer effects in detail in the next section.

The preference for more than two children increases with an increase in marital duration. Bigger households are associated with a preference for larger family size as well, with an increase in household size leading to increased preference for 3 or more children. The effect of the working status of a woman and her husband is consistent, with labour force participation increasing the probability of preferring one or two children. This is also supported by the marginal effect of wealth status: an increase in household wealth increases the preference for two children by 5.4 precent. Religion also has a significant effect on

[4] A full set of results for religious peers is available from the authors.

fertility preferences. Muslim women have a higher probability of preferring three or more children.[5] In addition to the above, we also investigate whether the peer effects vary by age (at 15, 20, 25, 30, 35, 40 and 45 years) and find that the overall magnitude and significance of effects are similar across the age distribution.[6]

Role of education

INSERT TABLE 6 HERE

We have discussed the significance and importance of peer fertility and education in terms of their individual effects on fertility preference. Here we document the role of education in moderating the peer effects on fertility. Table 6 reports the average marginal effect of neighbourhood peers and religious peers by a woman's education (years). An increase in peer fertility reduces the probability of preferring one or two children and increases the probability of preferring three or more children. This is the overall peer effect we identified earlier. However, the size of the effect changes with the education level, and this variation in peer effects points to an interesting role of education in moderating peer influence on fertility preferences.

The top panel of Table 6 reports the effect of neighbourhood peers. An increase in peer fertility reduces the probability that a woman has a preference for one or fewer children; the probability reduces by 0.8 percent for woman with no education, by 1.58 percent for woman with 12 years of education, and by 2.29 percent for woman with an equivalent of a bachelor degree. On the other hand, the reduction in the preference for two children is largest for women with no education (7.29 percent) compared to women with 12 years of education and

[5] Though not reported in Table 5, we have found region to have a significant effect on fertility preference. Compared to villages, women in cities and towns have a higher probability of preferring one or two children and a lower probability of preferring more than three children.
[6] Results available from authors.

tertiary educated women (probabilities for these fall by 6.18 percent and 3.44 percent, respectively). An increase in peer fertility increases the fertility preferences for three or more children. Peer effect has the greatest effect on the preference of educated women for three children; for example, this increases by 1.01 percent for women with no education and by 3.5 percent for tertiary educated women. However, even if the peer effect has a positive influence on the desire for larger family size (four, five, six or more children), educated women show only small increases. For example, the preference for five or six children increases by only 0.24 percent for tertiary educated women, compared to an increase of 1.3 percent (approx.) for women with no education.

The effect of religious peers (reported in the bottom panel of Table 6) further supports the findings of education moderating the influence of peer fertility. Similarly to the above discussion, education amplifies the magnitude of the peer effect in decreasing the preference for one child (or fewer) and increasing the preference for three children. On the other hand, education reduces the magnitude of peer effect on preferences for more than three children.

Looking at the effect of the two peer groups – neighbourhood peers and religious peers – on the fertility choices of a woman, some interesting observations are worth mentioning:

- As we observed earlier, fertility norms prevailing in common religion groupings, in general, have a greater influence on fertility choices for smaller family size (one or three children); and fertility norms prevailing in the immediate neighbourhood influences more the fertility choices for a larger family (four or more children). This result holds irrespective of the education level of a woman.
- The role of education in the preference for two children is particularly noticeable. Religious peers influence the fertility choice of two children for women with no or

low education (less than 12 years of education), while neighbourhood peers have more influence on women with 15 and more years of education.

- Though the preference for bigger families (more than four children) is greatly influenced by the observed fertility in the immediate neighbourhood, this neighbourhood peer effect decreases considerably as the number of education years increases. For a woman with 18 to 21 years of education, this effect is estimated to be in the range of 0.2-0.3 percent; for a woman with 0 to 3 years of education, this effect is in the range of 1.2-1.3 percent.

Peer effects by Wealth Status

INSERT TABLE 7 HERE

We also explore how wealth status influences peer effects. The peer effects reported in Table 7 show two notable features. First, the fertility norms prevailing in the immediate neighbourhood have a differential impact on women belonging to wealthier households and on women belonging to poorer households. On the other hand, the impact of religious peers does not vary much by the wealth status. This difference is particularly noteworthy for the preference for three children: that is, an increase in neighbourhood peer fertility leads to a 1.7 percent increase in the preferences of women from richer households, while the preferences of women from poor households increase by only 0.7 percent. Looking at the effect of religious peers on fertility choices, we notice that an increase in religious peers' fertility increases the preference for three children by 5.6 percent for richer households and 4.8 percent for poorer households. Second, in line with the findings for education and irrespective of wealth status, fertility norms prevailing in common religion groupings influence preferences for smaller family size (one to three children) while fertility norms

prevailing in immediate neighbourhood influence fertility preferences for a larger family (four or more children).

4. Discussion

The results show the importance of peers, both geographical and religious, in determining the fertility preferences of women. Our results are robust to alternative estimation strategies as reported in appendix A2. We find empirical evidence supporting the role of conformist social norms in women's fertility preferences. Women do respond to the family size norm in their social environment (Bhattacharya and Chakraborty, 2012). The biggest impact of increased fertility of a peer group is in reducing the preference for two children and shifting it towards the preference for three or four children. This effect is particularly notable for women from better wealth status households. While an increase in peer fertility does increase the preference for more children, women exhibit a strong preference for no more than four children. Despite an increase in peer fertility, the preference for five or six children generally increases by less than 1 percent.

The influence of the two peer groups is not symmetric and reveals the relative importance of neighbours and religious groups. The fertility norms of the religious group have a greater effect on the desire for smaller family size, reducing the preference for two children by almost 7 percent. On the other hand, an increase in the preference for a larger family (more than three children) is influenced more by the immediate social environment, the observed fertility in the neighbourhood. Policy makers in countries characterized by high fertility and low incomes aim to reduce the fertility rate; on the other hand, many advanced economies attempt to increase the fertility rate. Our results suggest that policy interventions targeting neighbourhoods or local communities can have a greater impact through the preference for

four or more children, while the bigger impact of policies targeting religious groups can be through the preference for one, two or three children.

Stable social groups with conformist behaviour can lead to sub-optimal equilibrium traps, because an individual's incentive to choose an action to conform to her social group can overwhelm her incentive to choose for intrinsic reasons (Akerlof, 1997). In this context, our findings regarding education can provide a useful policy direction. Education plays an important role by reducing the preference for more than two children and further moderating the influence of peer fertility. Even though an increase in the observed fertility of peers has a positive influence on women's preference for more children, better-educated women tend to gravitate towards preferring two to three children. Educated women are less influenced by peer fertility in their preference for more than three children. This moderating influence of education could be due to the well-documented effects of education such as increased opportunity cost of childbearing (see Kravdal (2002) for a review of effects of education on fertility), and/or by providing an alternative peer group for the woman to reference her fertility choices. This finding provides additional support for investment in education as a means to lower fertility rates. The moderating role of education would be of particular interest to policymakers seeking to lower the fertility rate in developing countries with high fertility, where larger family size is a social norm within community and religious groups.

There is scope to extend the analysis to gain further insights into these effects. The identification of peer effects raises questions about isolating the causal effects, as seminally explored by Manski (1993). There can be a propensity for a person's behaviour to vary positively with the group behaviour through many channels, including through the behaviour of the group (endogenous interactions), based on the exogenous characteristics of the group,

or through shared context or characteristics (correlated effects). While these effects cannot be separately identified with the employed data, availability of longitudinal data would shed further light on the causal relationships and channels of peer effects.

5. Conclusion

We investigate the impact of changes in average fertility of peer groups on the fertility preferences of women. In the context of India, we identify two peer groups – neighbourhood and religious peers. These two peer groups identify the transmission of fertility norms through observed behaviour in the surroundings and through religious traditions and practices. We find that both peer groups have a significant influence on women's fertility preferences. Peers have the most profound impact on the fertility preference for two to three children. With the increase in fertility rates of her peers, a woman is more likely to have a preference for three children (over two children). We find that women are more likely to be influenced by the fertility norms of their religion cohort in their choice of one to three children, while the fertility norms prevailing in their immediate neighbourhood have a greater influence on the preference for a bigger family size (four or more children).

We also examine the role of education and wealth as transmission channels between the fertility norms of peers and fertility preferences of women. We find that neighbourhood peers (unlike religion based peers) have a differential impact on the fertility choices of women of different wealth statuses. Neighbourhood peers affect the fertility choices of women from wealthier households more, compared to the fertility choices of women from poor households. Out of the two aforementioned channels of transmission, education is found to be the most important in moderating peer influences. Educated women (with 12 or more years of education) are more influenced by their peers in their fertility choice of smaller families (one

to three children) and less in the fertility choice of bigger families (four or more children), while the opposite holds for women with no or less than 12 years education. It has to be noted that the difference in peer effects between low educated women and better educated women are most pronounced for the fertility choice of three children. An increase in peer fertility greatly increases the preference for three children for educated women but does not have much effect on the preference of no or low educated women.[7]

Understanding women's fertility preferences and identifying the main channels of influence for these preferences is vital for informing family planning and gender policies. In the context of India, this paper shows that women reference their fertility preferences from their neighbours and religious groups. Hence, attempts to change fertility norms should target the peer group, not just the individual. The analysis also shows that education is an effective means of channelling these fertility norms.

[7] Educated women are defined to be those who have 12 or more years of education while low educated women are those ones who have 0 to three years of education.

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Table 1: Peer groups: Descriptive Statistics

	NFHS1		NFHS2		NFHS3	
			Neighbourhood peers			
No of Households in a PSU	No of PSUs	Percent (%)	No of PSUs	Percent (%)	No of PSUs	Percent (%)
Less than 10	338	11.81	118	4.37	136	5.09
10 to 20	1,511	52.81	1,315	48.74	1,410	52.73
20 to 30	809	28.28	1,067	39.55	941	35.19
30 to 40	159	5.56	165	6.12	153	5.72
40 to 50	36	1.26	27	1	34	1.27
More than 50	8	0.28	6	0.22	-	-
Total no of PSUs	2861		2698		2674	
Average number of Households in a PSU	18		19		18	
			Religious peers			
	No of women		No of women		No of women	
Average number of women in a peer group	219		225		230	
(Standard deviation)	(584.38)		(608.17)		(486.89)	

Notes:

- PSU refers to Primary Sampling Units of NFHS survey. A PSU constitutes a peer group defined as neighbourhood peers.
- Religious peers is defined as a group of women of a particular religion (Hindu, Muslim, Christian, Sikh or others) in a region (capital (or large) city, small city, town or countryside) within a state.

Table 2: Descriptive Statistics

Variables	Mean	Standard Deviation	Minimum	Maximum
Fertility rate: Neighbourhood peers	3.629	0.791	1	8
Fertility rate: Religious peers	2.877	0.412	1	8
Women Education (Years)	3.107	4.376	0	23
Husband Education (Years)	5.826	5.039	0	30
Household Head Education (years)	5.023	4.909	0	24
Women Age(Years)	34.182	7.893	15	49
Husband Age(Years)	40.127	9.011	15	70
Household Head Age (Years)	45.228	12.181	15	90
Household Size	7.021	3.441	1	39
Marital Duration(grouped, in years)	0-4 : 5.24% , 5-9: 14.96% ,10-14: 19.65%, 15-19: 19.76%, 20-24: 18%, 25-29: 14.23%, 30+: 8.16%			
Sex of Household Head	Male: 94.16%, Female: 5.84%			
Women Working	Working: 35.22%, Not Working: 64.78%			
Husband working	Working: 97.67%, Not Working: 2.33%			
Wealth Status	Poor to Poorest: 36.21%, Medium, Rich to Richest: 63.79%			
States (sample distribution) (% of All India Sample)	Andhra Pradesh: 5.13% Assam: 4.02% Bihar: 7.95% Gujarat: 4.74 Karnataka: 5.50% Kerala: 3.18% Madhya Pradesh: 8.95% Maharashtra: 6.73% Orissa: 5.25% Punjab: 3.77% Haryana: 3.72% Himachal Pradesh: 3.54 Delhi: 3.65% Rajasthan: 7.77% Tamil Nadu: 5.05% Uttar Pradesh: 15.56% West Bengal: 5.49%			
Regions (Sample Distribution)	Capital (or large) Cities: 13.71%, Small Cities: 7.73%, Towns: 11.18%, Countryside(Villages): 67.38%			
Religion (Sample Distribution)	Hindu:81.66% Muslim:12.75% Christian:1.70% Sikh:2.70% Others:1.18%			

Notes:

- Descriptive statistics reported for the three NFHS samples (NFHS1:1992-93, NFHS2: 1998-99 and NFHS3: 2005-06) pooled together.
- Fertility rate calculated as an average fertility rate (number of living children/number of women).

Table 3: Fertility rate by peer groups

	NFHS1		NFHS2		NFHS3	
State	Neighbourhood peers	Religious peers	Neighbourhood peers	Religious peers	Neighbourhood peers	Religious peers
Andhra Pradesh	3.441	2.722	3.099	2.485	3.081	2.527
Assam	4.203	3.207	3.824	2.941	3.318	2.578
Bihar	4.037	3.134	4.114	3.225	4.329	3.353
Gujarat	3.628	2.883	3.421	2.772	3.243	2.624
Karnataka	3.664	2.850	3.512	2.749	3.073	2.489
Kerala	3.118	2.461	2.720	2.287	2.525	2.145
Madhya Pradesh	3.835	2.986	3.884	3.096	3.615	2.913
Maharashtra	3.620	2.909	3.284	2.698	3.065	2.511
Orissa	3.499	2.763	3.369	2.705	3.158	2.533
Punjab	3.619	2.968	3.253	2.708	3.059	2.509
Haryana	3.765	2.993	3.613	2.915	3.327	2.730
Himachal Pradesh	3.452	2.843	3.251	2.696	2.955	2.471
Delhi	3.582	2.805	3.423	2.731	3.345	2.671
Rajasthan	3.950	3.096	4.040	3.183	4.016	3.177
Tamil Nadu	3.367	2.646	2.912	2.351	2.647	2.238
Uttar Pradesh	4.121	3.180	4.148	3.260	4.257	3.352
West Bengal	3.810	2.861	3.345	2.569	3.179	2.460
All India	**3.761**	**2.946**	**3.646**	**2.901**	**3.456**	**2.770**

Notes:

- Fertility rate is calculated as an average fertility rate (number of living children/number of women).
- Neighbourhood peers consist of women living within a PSU (Primary Sampling Unit) of NFHS survey.
- Religious peers is defined as a group of women of a particular religion (Hindu, Muslim, Christian, Sikh or others) in a region (capital (or large) city, small city, town or countryside) within a state.

Table 4: Average Marginal Effects of Peers on Fertility preference

Fertility Preference (no of children)	**Neighbourhood peers**	**Religious peers**
1 or less	-0.010***	-0.017***
Equal to 2	-0.066***	-0.069***
Equal to 3	0.012***	0.052***
Equal to 4	0.038***	0.030***
Equal to 5	0.012***	0.003**
6 or more	0.013***	0.001

Notes:

- *** denotes statistical significance at 1%; ** denotes statistical significance at 5%; * denotes statistical significance at 10%.
- The table reports the average marginal effect of fertility of neighbourhood peers (women living in the neighbourhood) and religious peers (groups of women of a particular religion in a region within a state) on fertility preference. The multinomial logit model specified in equation (1), includes controls for education (woman, husband and household head), age (woman, husband and household head), marital duration, household size, sex of household head, work status (woman and husband), wealth, state, region within the state, survey round and religion.

Table 5: Average Marginal Effects other controls variables in the model for Neighbourhood peers

	Fertility preference (No of children)					
Variables	1 or less	Equal to 2	Equal to 3	Equal to 4	Equal to 5	6 or more
Education (years)						
Woman	0.002***	0.016***	-0.004***	-0.010***	-0.003***	-0.002***
Husband	0.000	0.003***	0.002***	-0.003***	-0.001***	-0.001***
Household Head	0.001***	0.001***	-0.001***	-0.001***	-0.000**	0.000
Age (years)						
Woman	0.001***	-0.000	-0.002***	0.001***	0.000	0.000***
Husband	0.000***	0.001***	-0.000***	-0.000***	-0.000***	-0.000***
Household Head	0.000***	-0.001***	-0.001***	0.000*	0.000***	0.001***
Marital Duration	-0.009***	-0.032***	0.016***	0.014***	0.005***	0.006***
Household Size	-0.001***	-0.008***	0.001***	0.005***	0.002***	0.002***
Male Household Head	-0.003***	-0.014***	0.004	0.012***	-0.002*	0.004**
Work						
Woman	-0.003***	-0.004***	0.000	0.004***	0.000	0.002***
Husband	0.003**	0.007*	-0.009**	-0.006	-0.001	0.006***
Wealth Status	0.002**	0.054***	0.005***	-0.034***	-0.013***	-0.014***
Religion						
Hindu	0.007***	-0.001*	0.020***	-0.013**	-0.003	-0.001
Muslim	-0.002	-0.103***	0.020***	0.045***	0.017***	0.023***
Christian	0.000	-0.060***	0.042***	-0.004	0.013***	0.008**
Sikh	0.014***	0.032***	0.006	-0.008	-0.021***	-0.023***

Notes:

- *** denotes statistical significance at 1%; ** denotes statistical significance at 5%; * denotes statistical significance at 10%. The table reports the average marginal effect on fertility preference.
- 'Male Household Head' has value = 1 if household head is male and value = 0 if female. 'Husband working' has value = 1 if currently working and value = 0 if not working. 'Women working' has value = 1 if currently not working and value = 0 if working. 'Wealth Status' has value = 1 if a woman belongs to 'medium, richer and richest' and value = 0 if she belongs to poor to poorest economic status.
- Estimation include controls for states (17 in total), regions (capital (or large) city, small city, town and village) and NFHS rounds (3 in total). The reference state for state level dummies is West Bengal; the reference region for region dummies is 'village'; the reference round for round dummies is 'NFHS round1'; the reference religion for religion dummies is 'others'.

Table 6: Marginal Effects of Peers by Education

Fertility preference	**Years of education**				
(No of children)	0	9	12	18	21
			Neighbourhood peers		
1 or less	-0.008***	-0.014***	-0.016***	-0.020***	-0.023***
Equal to 2	-0.073***	-0.068***	-0.062***	-0.045***	-0.034***
Equal to 3	0.010***	0.031***	0.035***	0.036***	0.035***
Equal to 4	0.043***	0.035***	0.031***	0.022***	0.018***
Equal to 5	0.013***	0.007***	0.006***	0.003***	0.002***
6 or more	0.014***	0.008***	0.006***	0.003***	0.002***
			Religious peers		
1 or less	-0.012***	-0.024***	-0.028***	-0.038***	-0.044***
Equal to 2	-0.078***	-0.073***	-0.064***	-0.039***	-0.024***
Equal to 3	0.052***	0.065***	0.065***	0.059***	0.053***
Equal to 4	0.033***	0.027***	0.024***	0.016***	0.013***
Equal to 5	0.004***	0.003***	0.002***	0.001***	0.001***
6 or more	0.002	0.002**	0.001***	0.001***	0.001***

Notes:

- *** denotes statistical significance at 1%; ** denotes statistical significance at 5%; * denotes statistical significance at 10%.
- The table reports the average marginal effect of fertility of neighbourhood peers (women living in the neighbourhood) and religious peers (groups of women of a particular religion in a region within a state) on fertility preference. The multinomial logit model specified in equation (1), includes controls for education (woman, husband and household head), age (woman, husband and household head), marital duration, household size, sex of household head, work status (woman and husband), wealth, state, region within the state, survey round and religion.

Table 7: Marginal Effects of Peers by Wealth Status

Fertility preference	**Wealth Status of the Household**	
(No of children)	Medium to richest	Poor to poorest
	Neighbourhood peers	
1 or less	-0.010***	-0.010***
Equal to 2	-0.068***	-0.067***
Equal to 3	0.017***	0.007***
Equal to 4	0.039***	0.040***
Equal to 5	0.011***	0.013***
6 or more	0.011***	0.016***
	Religious peers	
1 or less	-0.017***	-0.017***
Equal to 2	-0.072***	-0.069***
Equal to 3	0.056***	0.048***
Equal to 4	0.030***	0.032***
Equal to 5	0.003**	0.003***
6 or more	0.001	0.002

Notes:

- *** denotes statistical significance at 1%; ** denotes statistical significance at 5%; * denotes statistical significance at 10%.
- The table reports the average marginal effect of fertility of neighbourhood peers (women living in the neighbourhood) and religious peers (groups of women of a particular religion in a region within a state) on fertility preference. The multinomial logit model specified in equation (1) includes controls for education (woman, husband and household head), age (woman, husband and household head), marital duration, household size, sex of household head, work status (woman and husband),wealth, state, region within the state, survey round and religion.

Appendix A1

Table A1: Number of Women and Average Fertility Rate by Religion

Religion	**NFHS 1**		**NFHS2**		**NFHS3**	
	Number of Women	Avg. fertility rate	Number of Women	Avg. fertility rate	Number of Women	Avg. fertility rate
Hindu	48063(83.0%)	2.9	50627(83.9%)	2.9	45111(80.7%)	2.7
Muslim	5754(9.9%)	3.4	6197(10.3%)	3.4	7220(12.9%)	3.4
Christian	1284(2.2%)	2.7	1148(1.9%)	2.5	1224(2.2%)	2.3
Sikh	2045(3.5%)	2.9	1700(2.8%)	2.6	1533(2.7%)	2.4
Others	783(1.4%)	2.8	645(1.1%)	2.7	841(1.5%)	2.5
Total	57929	2.9	60317	2.9	55929	2.7

Appendix A2: Robustness check using alternative methodologies

The sample design of NFHS survey entails multi stage stratified sampling.[8] Given the multilevel nature of survey data, we implement multilevel modelling with two level random intercept models. We consider a two level system where a total of n individuals (or women in our case at level 1) are nested within J groups (states in our case at level 2).[9] We use a 'two level random intercept model' where state level random effects are modelled as random intercepts for each state.

For a binary response variable y_{ij}(fertility preference), $E(y_{ij}|x_{ij,}, u_j) = \pi_{ij} = \Pr(y_{ij} = 1)$ and a generalised linear random intercept model for the response probability π_{ij} can be written as:

$$\Pr(y_{ij} = 1|\, x_{ij,}, u_j) = \beta_0 + x_{ij}\beta + u_j$$

The model is estimated for two specifications of the dependent variable. In specification 1 fertility preference 1 takes value 0 for ideal family size of two or less than two children and 1 for preference for 3 or more children, while in specification 2, fertility preference 2 is equal to 0 if ideal family size is 3 or less children and is equal to 1 otherwise. Here, $j = 1 - 17\ states$, with each state j consisting of $i = 1, \ldots\ldots n_j$ observations. The vector x_{ij} are the covariates for fixed effects (which in our case includes fertility rates of neighbourhood peers (or religious peers) including other control variables) with regression coefficient (fixed

[8] The sample design for each state is a systematic, stratified sample of households with two stages in Rural Areas (selection of villages followed by selection of households) and three stages in urban areas (selection of cities/towns, followed by urban blocks and then households). More details are available at http://www.measuredhs.com/pubs/pdf/FRIND1/FRIND1.pdf for NFHS1; http://www.measuredhs.com/pubs/pdf/FRIND2/FRIND2.pdf for NFHS2; and http://www.measuredhs.com/pubs/pdf/FRIND3/FRIND3-Vol1AndVol2.pdf for NFHS3

[9] We decided to apply a two level structure as our sample is representative only at the state level.

effects)β. u_j are the state level random effects (or residuals) which are represented, here, as state level random intercepts. β_0 is the overall intercept in the model and the intercept for the given state j is $\beta_0 + u_j$ which can be higher or lower than the overall intercept depending on whether u_j is greater than or less than 0. The variance for intercepts across states is $var\left(u_j\right) = \sigma_j^2$ and is specified as the between state variance adjusted for $x's$. We estimate the ordinary logit model with state level fixed effects as well as the two level random intercept logit model with state level random effects. We also estimate a standard regression model, treating the dependent variable as continuous. The results from these models serve as important robustness checks since, given the multi-level aspect of the present analysis, standard regression could be biased. As reported in table A2, the effect of neighbourhood peers and religious peers on a woman's preferred number of children remains statistically significant and positive under alternative specifications.

Table A2: Effect of Peers on Fertility Preference from Alternative Model Specifications

Specification	Neighbourhood peers	Religious peers
Fertility Preference as continuous variable		
Ordinary Least Square (OLS)	0.182***	0.018**
Fertility Preference 1 (binary variable)		
Ordinary Logit with State level fixed effects	0.437***	0.434**
	(1.54***)	(1.54**)
Two level Logit with State level random effects	0.508***	1.06**
	(1.66***)	(2.90**)
Fertility Preference 2 (binary variable)		
Ordinary Logit with State level fixed effects	0.456***	0.315**
	(1.57***)	(1.37**)
Two level Logit with State level random effects	0.495***	1.15**
	(1.64***)	(3.17**)

Notes:

- The table reports the coefficient of fertility rate ((number of living children/number of women) of neighbourhood peers and religious peers on the fertility preference of a woman.
- *** denotes statistical significance at 1%; ** denotes statistical significance at 5%; * denotes statistical significance at 10%. Figures in parentheses in rows 4 and 5 are Odds Ratio for logit models.
- Fertility preference1: value = 0 for preference less than or equal to two children and value = 1 otherwise; Fertility preference 2: value = 0 for preference less than or equal to three children and value = 1 otherwise.

- Estimations include education and age (in years for woman, husband and household head), marital duration, household size, and dummy variables for women and husband work status, woman's wealth status and other fixed effects like region, religion, state and time (NFHS round) as control variables.